

LADEE PDS4 Experience

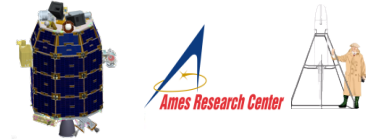
G. Delory

LADEE Instrument and PDS Teams

LADEE SOC

PDS Management Council Nov 18-19 2014

11/19/2014



LADEE PDS Overview

- **Generation and submission of science data to the Planetary Data System (PDS) is a program-level requirement for the LADEE mission**
- LADEE has had a PDS process in place since 2009
 - Developed overall plan and strategy, captured in the Data Management and Archive Plan (DMAP)
 - Became the “test subject” for the new PDS4 standard
- Formation of the Data Archive Working Group (DAWG) in Feb 2011
- Subsequent incorporation of NAIF activities



DAWG Process

- Keep DAWG simple, and low-maintenance
 - Instrument teams were already experienced in PDS product development
 - Set agenda, but few pre-made presentations
 - Encourage open interaction and working sessions
- Main activity consisted of a bi-weekly (at most) telecon
 - Goals, deliverables, schedules tracked
 - Issues brought up and dealt with as needed
- Feedback generally positive about the DAWG meeting schedule and effectiveness



Schedule / Development Plan

Original Plan

- Produce data products up to the Calibrated Level
- Deliver full mission science data within EOM + 4 months; 2 months of peer review; final delivery by EOM + 6 months

Funding Crunch Plan

- Produce data products up to the Calibrated Level
- Deliver sample of science data at EOM for peer review
- Deliver complete data set by EOM + 3 months

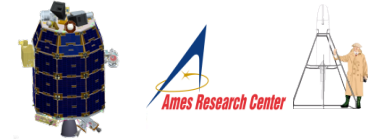
Cadillac Plan (current)

- Original plan + produce data products up to Derived Level
- Several deliveries based on mission start date, mission phase, and LDAP needs



LADEE Data Delivery

- Mission is divided into two phases: Science (100 days) and Extended Science (100+ days to impact)
- Delivery of the Science phase calibrated data products by start of science phase + 6 months:
 - August 21st, 2014
 - In time for inclusion in LDAP call
- Delivery of Extended Science phase calibrated data products by start of science phase + 1 year:
 - November 21st, 2014
- Delivery of Derived products TBD but expected based on extended funding for the team
 - Could be a topic of discussion at this meeting



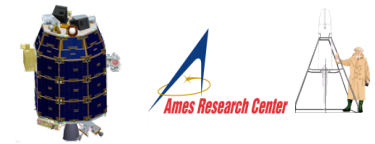
PDS4

- By and large, most data processing tasks and workload similar to previous missions
- Some differences due to:
 - Adoption of xml for labels, metadata
 - Allowing PDF/A documentation
 - Change in definition of data processing levels
 - Bundle construction/organization
- Most of these changes were positive
- Feels like a lot went on behind the scenes at the PDS that we didn't see



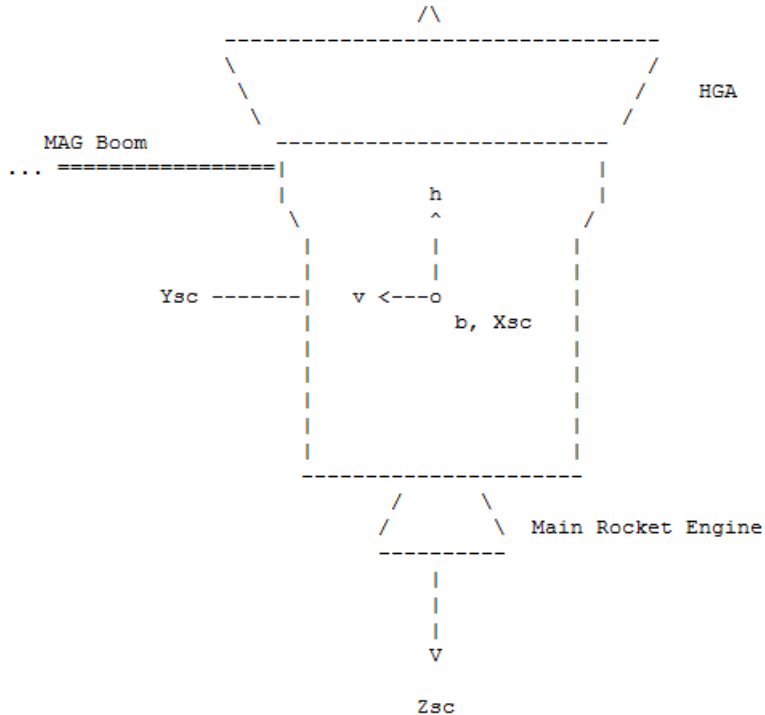
Use of XML

- From the management/DAWG chair level, use of xml appeared to go smoothly for the instrument teams
- Important to note significant help and assistance from the PDS
- Given that xml is an established standard, adoption seems reasonable
- Instrument team reps will provide additional feedback later in this meeting



Documentation

Before



After

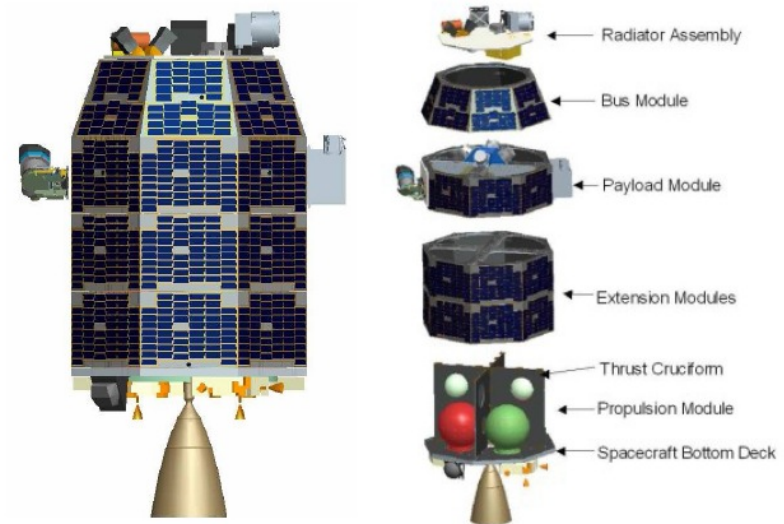


Figure 3-1: LADEE major structural components and layout

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PDS4 – New Data Levels

PDS4	NASA (PDS3)	Description
Packet Data	Packet Data	Telemetry data stream as received at the ground station, with science and engineering data embedded.
Raw Data	Level 0	Instrument science data (e.g., raw voltages, counts) at full resolution, time ordered, with duplicates and transmission errors removed. Prior to PDS4, referred to as Experiment Data Records (EDRs).
Reduced Data	Level 1A	NASA Level 0 data that have been located in space and may have been transformed (e.g., calibrated, rearranged) in a reversible manner and packaged with needed ancillary and auxiliary data (e.g., radiances with the calibration equations applied). Prior to PDS4, referred to as Calibrated Data Records (CDRs) and in some cases Derived Data Products (DDPs).
Calibrated Data	Level 1B	Irreversibly transformed (e.g., resampled, remapped, calibrated) values of the instrument measurements (e.g., radiances, magnetic field strength). Prior to PDS4, referred to as either Derived Data Products (DDPs) or Derived Analysis Products (DAPs).
Derived Data	Level 2	Geophysical parameters, generally derived from NASA Level 1 (CODMAC level 3 and 4) data, and located in space and time commensurate with instrument location, pointing, and sampling. Prior to PDS4, referred to as Derived Analysis Products (DAPs).
	Level 3	Geophysical parameters mapped onto uniform space-time grids. Prior to PDS4, referred as derived analysis products (DAPs).

New data level definitions worked well.

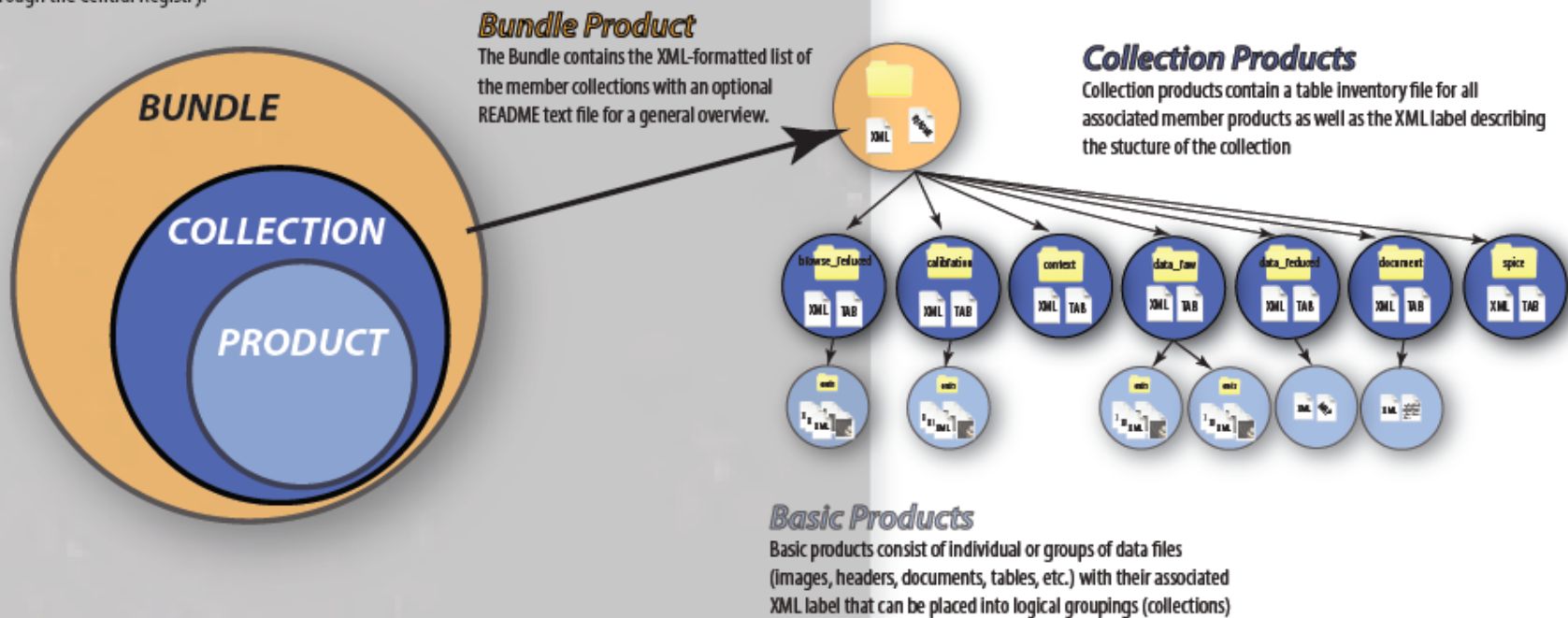
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Bundle Organization

Figure 1. New organization of the data architecture. Bundles contain Collections and Collections contain Products. Bundles, Collections, and Products are all registered as products, and are uniquely identified and trackable through the Central Registry.



R. Beebe DPS Poster 2014

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Navigation and Ancillary Information Facility (NAIF)

- Not part of PDS4, but worth mentioning
- Was a little rough at the beginning, but we finally figured it out
- Led by the LADEE Science Operations Center (SOC)
 - Responsible for submission of data products to NAIF
 - With help/input from the ARC FDS
 - Science team weighed in on SPICE kernels when appropriate
- NAIF representatives are DAWG members
 - Have been reviewing plans and providing lots of help/input for the past ~18 months
- NAIF product generation/submission delivered with similar schedule as Science Phase PDS products (i.e., August-October this year)



Summary

- PDS4 was different than PDS3 and hence resulted in a little more work
- Many advantages to PDS4 (so extra work was worth it)
- Instrument teams have feedback on their individual experiences on the ground and in the trenches
- Although not part of PDS4, awareness of NAIF requirements and how these fit into PDS deliveries needs to be increased